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THE GENUS *ERYSIMUM* (CRUCIFERAE) IN NORTH AMERICA NORTH OF MEXICO—A KEY TO THE SPECIES AND VARIETIES

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This key to twenty-three species and eight varieties of *Erysimum* is a result of detailed analysis of the specimens in various American herbaria plus collections of the writer from areas throughout most of the range of these taxa in the United States. Many morphological interrelationships exist among the various taxa, these usually manifesting themselves as local geographical forms which presumably have a genetical-ecological basis. Some of these forms are of sufficient magnitude to be treated as varietal entities. In a careful attempt to express much of this variability in the key, it frequently has been necessary to rely for identification upon a combination of many characteristics, to refer to exceptions and make cross-references, and to key three taxa twice. However, with understanding of the diagnostic characteristics and realization of the close relationships, the great majority of plants can be relegated to reasonably definite taxa. In order to present a survey of geographical distribution, a summary of the range of each taxon is added to the key.

Although the genus is native south through Mexico into Guatemala, taxa presumably limited to these countries are omitted due to insufficient representation. Thus at least two probably acceptable Mexican species,

*Erysimum Tilimi* J. Gay and *E. macradenium* J. Gay, are excluded from this key. Forms of *E. capitatum* (Dougl.) Greene, *E. insulare* Greene, and possible forms of *E. argillosum* (Greene) Rydb. also occur in Mexico as well as northward.

- A. Petals small, 3–13 mm. long, just under 1–5 mm. broad; seeds 2 mm. long or much shorter, 1 mm. broad or narrower.
- B. Annuals.
- C. Axis of mature raceme geniculate; siliques divaricate, (4–)6–8(–8.5) cm. long, moniliform at maturity; pedicels consistently short, under  $\frac{1}{2}$  as long as siliques, nearly as thick as siliques, 1–1.5 mm. thick; margins of leaves repand-dentate. Widespread weed from Europe.....*E. repandum* L.
- CC. Axis of mature raceme straight; siliques more or less ascending, very short, (1–)1.5–2(–3.5) cm. long, not moniliform, plump; pedicels of various lengths,  $\frac{1}{3}$  to  $\frac{1}{2}$  as long as siliques, much more slender than siliques, not over and usually under 0.6 mm. thick; margins of leaves sparingly denticulate, often some entire. Widespread, often as a weed, native and from Europe.....*E. cheiranthoides* L.
- BB. Biennials or short-lived perennials, the latter usually at high altitudes, far north or coastal.
- D. Siliques 2–3 cm. long as known in North America, in Europe also to about 10 cm.; cauline leaves sparingly and shallowly denticulate on our plants. Weed from Europe, known in Ontario and Quebec.....*E. hieracifolium* L.
- DD. Siliques 4–10 cm. long, rarely less; cauline leaves usually entire.
- E. Petals 1–3 mm. broad; lower leaves often broadly and usually bluntly oblanceolate, broadest very near apex, not callose.
- F. Leaves usually cinereous, sometimes not so in cooler environments, as locally in northwest portion of range, usually not crowded; stems almost always single, or if more than one, usually strict; petals usually pale yellow, usually under 10 mm. long, usually 2 mm. or less broad. Great Lakes (local), to Nevada and Alaska.....*E. inconspicuum* (S. Wats.) MacMill.
- FF. Leaves not at all or scarcely cinereous, usually crowded; stems often more than one, spreading-ascending; petals usually rich yellow, usually 10 mm. or more long, 2 mm. or more broad. Local on Gulf of St. Lawrence and Newfoundland.....*E. inconspicuum* var. *coarctatum* (Fern.) G. B. Rossbach<sup>1</sup>
- EE. Petals 3–5 mm. broad, as known; lower leaves narrowly elongate, linear-oblanceolate, acute or subacute, callose. Known locally from desert of southern New Mexico . . . *E. desertorum* (Woot. & Standl.) G. B. Rossbach
- AA. Petals larger, 13–32 mm. long, rarely as short as 7 mm. (P–PP), (3–) + 3–15 mm. broad; seeds larger, usually 2 mm. or more long, usually 1 mm. or more broad (except J).
- G. Leaves never approaching a filiform shape, some or all as much as 2 or more mm. broad.
- H. Plants not suffrutescent, the caudex not notably elongate or long-branched above ground, erect, or at least not sprawling or widely spreading, sterile branches absent, or if present, very short, not elongate; lowest leaves dropping, breaking or long-lived, but scarcely marcescent. A few plants tending toward characters of HH.
- I. Seeds wingless or bearing a small scarios distal appendage, very slightly to convexly compressed, variously shaped; siliques equally tetragonal to

<sup>1</sup> The taxa attributed to the author were published as follows: Rossbach, George B. 1958. New taxa and new combinations in the genus *Erysimum* in North America. *El Aliso* 4:115–124.

- strongly compressed, equally to very unequally keeled. Not occurring on coast.
- J. Siliques very rigidly divaricate, equally or subequally tetragonal, with subequal, very protrusive keels prominent as four dark, less pubescent stripes; seeds small, about 1.5 mm. long, scarcely compressed, rather angular, almost always wingless; leaves narrowly oblanceolate, some or all dentate; foliar hairs crowded, quite strigose, 2-parted; stems rather low, commonly under 30 cm. to base of raceme. Great Plains, Black Hills, local prairie extensions into Rocky Mountains.....  
.....*E. asperum* (Nutt.) DC.
- JJ. Siliques ascending, occasionally becoming arching-divaricate when long and heavy, usually compressed, but ranging from subequally tetragonal to strongly compressed, very unequally to subequally keeled, not notably striped; seeds of variable size, more or less compressed, winged or wingless; leaves and stems variable.
- K. Leaves narrow, acute or subacute, usually thick, revolute and cinereous; foliar hairs 2-parted, usually crowded; siliques narrow, commonly about 1.5 mm. broad, subequally tetragonal to slightly compressed, most often subequally keeled, hairs usually crowded; seeds wingless or less often minutely winged, commonly not over 2 mm. long; petals yellow; stems usually low, commonly 8-30 cm. to base of raceme. Dry regions, mid-altitudes, mainly Rocky Mountains, Great Basin to eastern California, southwestern plateaus.....  
.....*E. argillosum* (Greene) Rydb.
- KK. Combination of characters not as above; foliar hairs 2- or 3-parted; siliques compressed, unequally keeled; otherwise variable.
- L. Some or all upper foliar hairs 3- or more parted, 2-parted hairs frequently also present, or locally in Southwest the hairs exclusively 2-parted; leaves usually dentate or denticulate, subacute to acute; siliques fairly protrusively keeled on flatter surfaces; seeds distally winged; fresh petals usually orange, also shades of yellow, brick-red, orange-brown, or locally in Southwest a purplish maroon, drying toward purple; stems usually tall, commonly 20-70(-135) cm. to base of raceme. Widespread, largely inland in hills, mainly Pacific states and east into Idaho, through southwestern states and locally east to Texas and northeast to Ohio; Mexico and southern British Columbia.....*E. capitatum* (Dougl.) Greene
- LL. Combination of characters not as above; foliar hairs usually but not always 2-parted; leaves variable; siliques with very slender, scarcely or non-protrusive keels on flattened surfaces; seeds variable; petals yellow, or some orange-yellow, or rose-red-purple (UU and TT); stems variable.
- M. Stems, except for impoverished individuals, robust and much-branched above, diameter near base commonly 4-12 mm., usually tall, about 12-60 cm. to base of raceme; foliar hairs usually dominantly 2-parted; seeds long, 2-4 mm., noticeably winged at distal end.
- N. Leaves elongate, linear-lanceolate, tapering gradually to quite acute apex, dentate, green; siliques slender, (1.5-)-2(-2) mm. broad, seeds remote; caudex somewhat prolonged; stems tall, commonly 30-60 cm. to base of major raceme, usually near 5 mm. in diameter at base. Dunes by San Joaquin River east of Antioch, California.....  
.....*E. capitatum* var. *angustatum* (Greene) G. B. Rossbach



- SS. Siliques torulose, curved in several planes, moniliform, not over 2 mm. broad, tapering very gradually and slenderly; style long, very slender, almost always under 0.5 mm. thick; lower leaves very shortly and broadly oblanceolate, not rounded, dentate; foliar hairs 2- often dominantly 3-parted; caudex multicapitous, becoming elongate if buried, bearing some sterile leaf rosettes; stems always low, 4-13 cm. to base of raceme. Known in alpine zone on Mount Steele and Mount Constance, Olympic Mountains, Washington....*E. arenicola* S. Wats.
- RR. Leaves not broadest very near apex, linear-lanceolate to oblanceolate, acute; foliar hairs 2-parted; sterile leaf rosettes often present.
- T. Petals yellow or rose-red-purple; raceme leafless and bractless.
- U. Foliar hairs crowded, strigose; very crowded leaves eventually marcescent on lower portions of stems, entire or very nearly so; petals yellow; seeds very elongate, 2-2.3 mm. long, 0.7 mm. broad. Known from vicinity of Dawson, Yukon.....  
.....*E. angustatum* Rydb.
- UU. Foliar hairs almost always sparse and delicate; leaves not marcescent, entire or few times dentate or denticulate; petals rose-red-purple or yellow; seeds obovate, 1.5-2 mm. long, 1-1.6 mm. broad. High altitudes in Rocky Mountains, most frequent in Colorado.....*E. nivale* (Greene) Rydb.
- TT. Petals always rose-red-purple; few to many of the lower pedicels subtended by or bearing bracts or leaves.
- V. Stems very low, (-1)-1-3(-5) cm. to base of raceme; leaves entire or very sparingly and shallowly dentate; only lowest few pedicels subtended by bracts. Widespread in arctic North America and Asia.....  
.....*E. Pallasii* (Pursh) Fern.
- VV. Stems taller, (8-)15-16(-18) cm. to base of raceme; lower leaves numerous and deeply dentate; many pedicels subtended by or some bearing a bract or small leaf. Known from Teller, western coast of Alaska.....*E. Pallasii* var. *bracteosum* G. B. Rossbach
- II. Seeds extensively winged about distal end and more or less along one side, strongly compressed, oval; siliques, at least when dry, very strongly compressed, unequally keeled.
- W. Style long, (2-)3(-5) mm.; leaves entire or occasionally sparingly denticulate, linear-oblanceolate, cinereous. Sands along middle Columbia River and nearby on tributaries....*E. occidentale* (S. Wats.) Robins.
- WW. Style shorter, scarcely present to 1(-2) mm. long; leaves variable, but not cinereous except in a northern form (Y). Coastal or near coast, or in case of *E. Cheiri* raised in gardens.
- X. Siliques stiffly divaricate, upcurved except for a few colonies not on dunes (under or near YY); pedicels divaricate.
- Y. Leaves oblong-spatulate or at least blunt, broadest toward base of stem, where measuring 4-13 (rarely -30) mm. broad; stems low, (1-)3-7(-13) cm. to base of raceme. Local on coastal dunes on and near Point Pinos, and Fort Bragg to several miles north, and on west side Humboldt Bay, California.....  
.....*E. Menziesii* (Hook.) Wettst.

- YY. Leaves linear-oblongate to oblongate, acute, becoming narrowly elongate toward base of stem, 1.5-3 (rarely -6) mm. broad; stems almost always taller, (3-)15-50(-83) cm. to base of raceme. Coastal sands along Monterey Bay; atypical forms along San Diego County and Santa Rosa Island, California.....  
.....*E. ammophilum* Heller
- XX. Siliques stiffly ascending, straight to slightly upcurved (though sometimes becoming arching-divaricate when long and lax); pedicels variable.
- Z. Stigma not bicornate, merely bilobed; leaves not soon deciduous, almost always regularly sinuate-dentate; foliar hairs usually dominantly 3-parted; petals rich yellow, yellow, or creamy white.
- A'. Leaves shortly oblongate, abruptly contracted to apex; siliques distally blunt or at least tapering abruptly to style; plants fleshy. Restricted to coastline, on bluffs and headlands, atypically and rarely on nearby dunes, locally from Point Reyes, Marin County, California, to The Heads, Curry County, Oregon.....  
.....*E. concinnum* Eastw.
- A'A'. Leaves linear-oblongate, elongate, almost always tapering rather gradually at both ends; siliques usually tapering gradually to style; plants not fleshy, sometimes very locally the coastal plants slightly so. See D' for unusual forms. Serpentine or sandy soil, near and only very locally on the coast, San Mateo County, and vicinity Mount Tamalpais, and at least formerly at Bodega Bay, California, and near mouth of Rogue River, Curry County, Oregon.....*E. franciscanum* G. B. Rossbach
- ZZ. Stigma bicornate, i.e. deeply divided, with long arching lobes; leaves always soon and progressively deciduous along the aging stout stem, entire or very sparingly and sharply serrulate-denticulate; foliar hairs 2-parted; petals variable in color, yellow, orange, brown-orange or with purplish hue. See also C'. Introduced from Europe, rarely persistent or escaped from gardens.....  
.....*E. Cheiri* (L.) Crantz
- HH. Plants suffrutescent, the caudex elongate, long-branched above ground, sprawling or widely spreading, bearing elongate sterile branches; leaves (except under C') becoming marcescent below. (A few plants tend toward characters of H.)
- B'. Seeds strongly compressed, extensively winged more or less along one side as well as about distal end; siliques compressed.
- C'. Stigma bicornate, i.e. deeply divided, with long arching lobes; leaves always soon and progressively deciduous along aging stem, entire or very sparingly and sharply serrulate-denticulate; foliar hairs 2-parted; petals variable in color, yellow, orange, brown-orange, or with purplish hue. See also ZZ. Not coastal in the Americas, introduced from Europe, rarely persistent or escaped from gardens.....  
.....*E. Cheiri* (L.) Crantz
- C'C'. Stigma not bicornate, only slightly 2-lobed; leaves not usually deciduous below, but more or less marcescent, almost always regularly sinuate-dentate; foliar hairs (2-)3(-many)-parted; petals rich yellow, yellow, or occasionally creamy white. Coastal or near-coastal.
- D'. Plants not fleshy, sometimes very locally the coastal plants slightly so; these unusual forms moderately suffrutescent and the sterile branches, if present, usually short; siliques usually tapering gradually to style, not fleshy, strongly compressed; style 1-2 mm. long; seeds not usually crowded; petals colored as above. See A'A' for

usual forms. Serpentine or sandy soil, near and only very locally on the coast, San Mateo County and vicinity Mount Tamalpais, and at least formerly at Bodega Bay, California, and near mouth of Rogue River, Curry County, Oregon.....*E. franciscanum* G. B. Rossbach

D'D'. Plants succulent; becoming suffrutescent, usually sprawling and branched and bearing some sterile stems; siliques tapering abruptly to style, fleshy, plump, but strongly compressed when dry; style -1(-1.8) mm. long; seeds usually crowded, often irregular in shape; petals rich egg-yellow. Coastal bluffs and headlands locally along San Mateo County and on near-coastal sandy slope in Santa Cruz County, California....*E. franciscanum* var. *crassifolium* G. B. Rossbach

B'B'. Seeds not strongly compressed, convex, distally winged or wingless; siliques variable.

E'. Plants succulent, notably suffrutescent and sprawling-ascending, or sometimes spreading-upcurved (F'), much-branched, bearing long vegetative stems; leaves notably marcescent below; siliques coarse, squarish in cross-section or compressed variously, either at right angles to or parallel to septum.

F'. Plants suffrutescent, branched, usually spreading-upcurved; leaves narrowly linear-oblongate, (1.5-)2-3(-5-rarely 6) mm. broad; siliques compressed parallel to septum or squarish in cross-section. Coastal sands, southern Santa Monica Bay, and from Santa Maria River to southern Morro Bay, California.....  
.....*E. suffrutescens* (Abrams) G. B. Rossbach

F'F'. Plants strongly suffrutescent, much-branched, sprawling at base; leaves variable; siliques plump, abruptly contracted at both ends, replete with crowded, irregular seeds, squarish in cross-section to compressed at right angles to septum.

G'. Leaves comparatively broad, 3-12(-20) mm. broad, tending toward two types, one large and abruptly tapering to blunt apex, not recurved, often terminating sterile branches, the other narrower, more gradually tapering, recurved, occurring at any location, usually fleshier; foliar hairs sparse, (2-)3(-4)-parted. Coastal dunes between Arguello and Purisima points, and rocky maritime bluffs of Morro Rock near Morro Bay, California.....  
.....*E. suffrutescens* var. *grandifolium* G. B. Rossbach

G'G'. Leaves all narrow, 1.5-3(-5) mm. broad, essentially of one type; foliar hairs crowded, 2-parted. San Miguel and Santa Rosa islands of the North Channel Islands, California, and a form with somewhat blunt, smaller leaves on Guadalupe Island, Baja California  
.....*E. insulare* Greene

E'E'. Plants not at all fleshy, only moderately suffrutescent, not sprawling, only once or few-times branched, bearing few and rather short sterile stems; leaves only moderately marcescent below; siliques slender, always quite compressed parallel to septum. See also O. Sandy mesas near Lompoc, Nipomo, and Guadalupe, California.....  
.....*E. suffrutescens* var. *lompocense* G. B. Rossbach

GG. Leaves nearly filiform, 0.3-1.7 mm. broad; stems suffused with somewhat metallic purplish hue, normally simple; caudex more or less elongate, herbaceous to subligneous, single or divided. Miocene Santa Margarita sand deposit in Santa Cruz Mountains, California.....*E. teretifolium* Eastw.